

I. 單選題 (2% each, total 40%)

- Which of the following amino acids are more likely to be found in a protein's interior away from aqueous solvent molecules?
A) Val, Leu, Ile, Met, and Phe
B) Ser, Thr, Asn, Gln, and Tyr
C) Arg, His, Lys, Asp, and Glu
D) All of the above
E) None of the Above
- Given multiple **enzymes** that can catalyze the same reaction, which of the following would be the best choice, given the kinetic parameters below?
A) Enzyme 1: $K_m = 10$, $V_{max} = 10$
B) Enzyme 2: $K_m = 0.5$, $V_{max} = 1$
C) Enzyme 3: $K_m = 2$, $V_{max} = 1$
D) Enzyme 4: $K_m = 0.1$, $V_{max} = 10$
E) Enzyme 5: $K_m = 0.5$, $V_{max} = 5$
- The α -amino acids have a carboxyl group with a pK around _____, and an amino group with a pK near _____.
A) 1.1, and 12.1
B) 6.5, and 8.0
C) 3.3, and 10.5
D) 2.2, and 9.4.
- Serine and threonine are polar amino acids due to
A) reactive hydroxyl group in the side chain
B) reactive alcoholic group in the side chain
C) reactive keto group in the side chain
D) reactive aldehyde group in the side chain.
- Which of the following is an example of tertiary structure in a protein?
A) A multimeric protein
B) An α -helix
C) A β -pleated sheet
D) A globular domain
- The peptide, Val-Lys-Glu-Met-Ser-Trp-Arg-Ala, was digested with cyanogen bromide (CNBr) to produce:
A) Val-Lys + Glu-Met-Ser + Trp-Arg-Ala
B) Val-Lys-Glu-Met-Ser-Trp + Arg-Ala
C) Val-Lys-Glu-Met + Ser-Trp-Arg-Ala
D) Val-Lys-Glu + Met-Ser-Trp-Arg-Ala
- In the enzyme-catalyzed reaction shown below, what will be the effect on substances A, B, C, and D of inactivating the enzyme labeled **E2**? $A \xrightarrow{E1} B \xrightarrow{E2} C \xrightarrow{E3} D$
A) A, B, C, and D will all still be produced
B) A, B, and C will still be produced, but not D
C) A and B will still be produced, but not C or D
D) A will still be produced, but not B, C, or D
- On the x and y axes of a Lineweaver-Burk plot, the largest values of substrate concentration will be found:
A) At the top of the y axis
B) At the intercept on the y axis
C) At the right end of the x axis
D) At the intercept on the x axis
E) At the origin

9. The cleavage specificity of trypsin and chymotrypsin depend in part on the
A) proximity of Ser 195 to the active site or specificity pocket
B) size, shape, and charge of the active site or specificity pocket
C) presence of a low-barrier hydrogen bond in the active site or specificity pocket
D) absence of water in the active site
10. Affinity chromatography deals with the
A) specific binding of a protein constituents for another molecule
B) protein - protein interaction C) protein - carbohydrate interaction D) none of the above
11. A purified protein sample contains 10 μg of protein and has an enzyme activity of 1 m mole of ATP synthesized/sec (1 unit). What is the specific activity of the final purified sample?
A) 1,000 units/mg B) 10,000 units/mg
C) 100,000 units/mg D) 1,000,000 units/mg
12. Bisphosphoglycerate (BPG) cannot bind to the oxygenated R state of hemoglobin because
A) it is displaced from the heme by oxygen
B) it is displaced from the heme by movement of the proximal histidine
C) its binding pocket becomes too small to accommodate BPG
D) BPG binds to the R state with the same affinity as the T state
13. When $[S] = K_M$, the velocity of an enzyme catalyzed reaction is about:
A) $0.1 \cdot V_{\max}$ B) $0.2 \cdot V_{\max}$ C) $0.3 \cdot V_{\max}$
D) $0.5 \cdot V_{\max}$ E) $0.9 \cdot V_{\max}$
14. In SDS-PAGE, the protein sample is first
A) treated with a reducing agent and then with anionic detergent followed by fractionation by electrophoresis
B) fractionated by electrophoresis then treated with an oxidizing agent followed by anionic detergent
C) treated with a oxidizing agent and then with anionic detergent followed by fractionation by electrophoresis
D) none of the above
15. Which reagent is best suited for determination of the amino acid sequence of a small peptide
A) Ninhydrin B) Phenyl isothiocyanate
C) CNBr D) Trypsin
16. Which of the following statements about protein structure is correct?
A) α -helix is stabilized primarily by ionic interactions between the side chains of amino acids.
B) The formation of the disulfide bond in a protein requires that the two participating cysteine residues be adjacent to each other in the primary sequence of the protein.
C) The stability of quaternary structure in proteins is mainly due to covalent bonds among the subunits.
D) The denaturation of proteins always leads to irreversible loss of secondary and tertiary structure.
E) The information for the correct folding of a protein is contained in the specific sequence of amino acids along the polypeptide chain.

17. The **primary** stabilizing force of protein **secondary** structure is:
- A) Ionic bonds. B) Covalent bonds. C) Van der Waals forces.
D) Hydrogen bonds. E) None of the Above
18. The local spatial arrangement of a polypeptide's backbone atoms without regard to the conformation of its side chains can be called?
- A) Primary structure B) Secondary structure C) Tertiary structure
D) Quaternary structure E) None of the Above.
19. Molar absorptivity is the measure of the
- A) amount of light absorbed per unit length
B) amount of light absorbed per unit concentration
C) amount of light reflected and absorbed per unit concentration
D) None of the above
20. Buffer solutions
- A) will always have a pH of 7
B) are rarely found in living systems
C) cause a decrease in pH when acids are added to them
D) tend to maintain a relatively constant pH

II. 問答題(60%)

1. Describe the molecular mechanism for insulin in regulation of glycogen synthesis. (6%)
2. Explain why less ATP is made from the reoxidation of FADH₂ as compared to NADH. (6%)
3. Give five coenzymes that are required in the conversion of pyruvate into acetyl-CoA and CO₂. (5%)
4. Ammonia is toxic to animals. Why? (3%)
5. Draw the structure of a mitochondrion and indicate the sites of β -oxidation and ATP synthase. (6%)
6. If the selectivity filter binds the potassium ion tightly in the potassium channel, how are ions released to pass through the membrane? (4%)
7. Aspirin that can reduce the formation of blood clot and has a function in anti-inflammation. Why? (6%)
8. Why is it more efficient to store energy as lipid rather than as glycogen? (6%)
9. List three major enzymes used in recombinant DNA technology. (6%)
10. Describe the dependence of the melting point of a fatty acid upon (a) chain length and (b) unsaturation. (6%)
11. Describe the function and the role of Na⁺K⁺ ATPase in animal cells. (6%)